REMARKS

In reply to the Office Action of August 20, 2008, Applicants have amended claims 1 and 20, canceled claim 15, and added new claim 21. Accordingly, claims 1, 5-14, 17, and 19-21 are pending, with claims 5-7, 9, and 19 presently withdrawn, and claims 1 and 20 in independent form.

Claim 20 stands objected to, as the Action alleges that claims 10 and 20 cover the same subject matter. Applicants have amended claim 20 in this reply so that claims 10 and 20 no longer have the same scope. Accordingly, reconsideration and withdrawal of the objection to claim 20 is respectfully requested.

Claims 1, 12-15, and 17 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shakuda (U.S. Patent No. 5,825,052, "Shakuda"). With respect to independent claim 1, the Action alleges that Shakuda discloses all of the limitations of claim 1 except for an active layer doped with a second n-dopant different from the first n-dopant, and further alleges that other embodiments in Shakuda provide the missing disclosure (Action at page 3). Applicants respectfully disagree with the rejection of claim 1 over Shakuda, for at least the following reasons.

Applicants do not agree that Shakuda discloses an n-doped confinement layer that "further includes the second n-dopant or an additional n-dopant" as required by claim 1. The Action purports to combine layers 2-4 in Shakuda's disclosure, alleging that this combination of layers forms the "n-doped confinement layer" recited by claim 1. Applicants respectfully disagree that this combination of layers can be characterized as a "confinement layer." Shakuda states that layers 2 and 3 in his devices are buffer layers, not confinement layers (see, e.g., Shakuda, col. 6, lines 10-13). In contrast, Shakuda's layer 4 is an "N-type clad layer" (Shakuda, col. 6, line 24). A person of skill in the art would understand that buffer layers and clad layers are different – buffer layers provide different functionality to a multilayer radiation-emitting stack than clad layers, including, for example, forming a growth surface with improve crystalline quality and/or a different lattice constant relative to an underlying substrate Indeed, Applicants' specification distinguishes buffer layers from confinement layers, stating that "[o]nly the layers

essential to an understanding of the invention are depicted in the schematic representation of Fig. 1 ... additional layers, such as for example buffer layers, interlayers, contact layers, ramps and the like, may also be present" (Applicants' specification at page 5, par. 4). Accordingly, Applicants submit that only Shakuda's clad layer 4 can be fairly considered to correspond to the claimed n-doped confinement layer of claim 1, and that grouping layers 2-4 together is not consistent with either Applicants' specification or the general understanding of a person of skill in the art.

With regard to Shakuda's clad layer 4, Applicants respectfully disagree that Shakuda discloses a clad layer that includes "the second n-dopant or an additional n-dopant" as claim 1 requires. The Action points to column 8, lines 24-28 and 33-42 of Shakuda as allegedly disclosing this feature (Action at page 3). Applicants have carefully considered these cited portions of Shakuda, but cannot arrive at the same interpretation as the Action describes. While Shakuda discloses "[a]t least two kinds, for example, S and Te among these gases are selected and introduced ... to allow that high temperature buffer layer 3 ... and the N-type clad layer 4 ... to be vapor deposited" (Shakuda, col. 8, lines 32-38), Shakuda goes on to state that "[a]ccording to this example, using the low electric resistance dopant S for the buffer layer and the dopant Te for the clad layer causes the PN junction to be hardly moved" (Shakuda, col. 8, lines 39-41). In other words, Shakuda appears to suggest that even when two dopants are combined in his reactive tube, one of the dopants is deposited in buffer layer 3 and the other dopant is deposited in clad layer 4. As discussed above, only clad layer 4 can be fairly interpreted as corresponding to the confinement layer recited in claim 1, and Applicants have not been able to find any disclosure in Shakuda relating to a clad layer 4 that includes a second n-dopant. Moreover, there does not appear to be any reason or suggestion in Shakuda to provide clad layer 4 with a second n-dopant. Accordingly, Applicants believe that Shakuda fails to either disclose or suggest an n-doped confinement layer that "further includes the second n-dopant or an additional n-dopant," as required by claim 1.

In this reply, claim 1 has been amended to include limitations from previously pending claim 15. Specifically, amended claim 1 covers radiation-emitting semiconductor components

where "at least one layer of the layer structure is formed of a material selected from the group consisting of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP." Previously pending claim 15 was rejected, the Action pointing to general disclosure in Shakuda as providing this subject matter (Action at page 4). In particular, the Action points to a portion of Shakuda which states that the "semiconductor layers laminated on the above-mentioned substrate may have a junction plane of an N-type layer and a P-type layer, and the N-type layer and/or the P-type layer may comprise a compound semiconductor in which part of the nitrogen in the gallium nitride type compound semiconductor is replaced with phosphorus and/or arsenic" (Shakuda, col. 4, lines 34-40).

Applicants have reviewed Shakuda in view of the Action's comments, and respectfully disagree that cited portion of Shakuda discloses the above limitation of amended claim 1. Shakuda's disclosure relates generally to "gallium nitride type compound semiconductor[s]" (Shakuda, col. 2, line 43) and to a particular problem associated with semiconductor components based on GaN layers. Shakuda notes that for such devices, which can include In as a dopant, "when the composition ratio of In becomes too large, [the] lattice constant becomes largely different from GaN as a buffer layer to cause [the] light emitting efficiency to be lowered, so that the limit of the composition ratio (1-y) of In is 0.2, and thus [the] wavelength of emitted light cannot be made longer than about 480 nm" (Shakuda, col. 2, lines 53-58). As a result, blue and green color LEDs with emission wavelengths of between about 490 nm and 520 nm cannot be obtained (Shakuda, col. 4, lines 59-64). Shakuda's solution to this problem is to add "an N-type dopant and a P-type dopant having the same amount ... to the above-mentioned active layer" (Shakuda, col. 4, lines 32-33) to allow for greater flexibility in adjusting the emission wavelength of his devices beyond 480 nm.

However, layers formed of one of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP do not typically feature the problem identified by Shakuda. To the contrary, for example, active layers based on one of these materials typically emit in one or more of the green, yellow, orange, red, and/or infrared regions of the electromagnetic spectrum. In other words, there would be no reason to dope active layers formed of these materials with equal amounts of n- and p-dopants, as these materials already exhibit the emission properties that Shakuda attempts to realize via his

doping techniques. Accordingly, it cannot be fairly stated that Shakuda discloses semiconductor components that include at least one layer "formed of a material selected from the group consisting of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP," as required by amended claim 1, for there would be no reason for Shakuda to employ his doping methods if his devices were formed from such materials.

In the present application, Applicants have explained that they have observed that electrical and/or optical qualities of layers formed from materials such as AlInGaP, AlGaAs, InGaAlAs, and InGaAsP can be improved via doping. For example, the application states that the improvement "can in particular take the form of suppressing ordering effects" (Applicants' specification at page 2, par. 6). Reducing ordering effects in such materials via doping can compensate for non-radiative recombination centers that are introduced into the layers by the dopants, thereby improving the overall efficiency of the device.

In contrast, Shakuda has apparently not recognized such effects, nor has he recognized that advantages can be obtained from doping layers formed of materials such as AlInGaP, AlGaAs, InGaAlAs, and InGaAsP. Applicants have been unable to find any disclosure in Shakuda relating to reducing ordering in layers formed of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP, or disclosure relating to any other reason why such layers should be doped. Accordingly, in view of Shakuda's failure to recognize such effects, and further in view of Shakuda's focus on doping GaN-based layers to adjust emission wavelengths beyond 480 nm (which does not appear to be relevant to layers formed of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP), Applicants submit that Shakuda neither discloses nor suggests semiconductor components where "at least one layer of the layer structure is formed of a material selected from the group consisting of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP," as required by amended claim 1.

In view of the foregoing, Applicants believe that independent claim 1 is patentable over Shakuda, and respectfully request reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. § 103(a). Claims 12-14 and 17 depend from claim 1, and are patentable over

Shakuda for at least the same reasons. Therefore, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 12-14 and 17 under 35 U.S.C. § 103(a) also.

Claims 8, 10-11, and 20 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shakuda in combination with Anayama (U.S. Patent Application Publication No. US 2002/0027935, "Anayama"). The Action alleges that Shakuda discloses most of the limitations of these claims, but relies on Anayama to disclose the first and second waveguide layers recited by these claims (Action at pages 4-5). Applicants respectfully disagree with these rejections, for at least the following reasons.

First, Applicants do not agree that a person of skill in the art would have had any reason to combine the disclosures of Shakuda and Anayama, as the Action purports to do. As discussed above, Shakuda's disclosure relates to doping GaN-based active layers of LEDs with approximately equal amounts of n- and p-dopants to increase the emission wavelength of such layers beyond 480 nm. Anayama's disclosure, in contrast, relates to laser diodes with inclined layers to avoid carrier overflow problems. Anayama's active layers (see, for example, active layer 60 in Figure 15J of Anayama) have "an MQW structure including three quantum well layers and two intervening barrier layers" (Anayama, page 8, par. 0135). A person of skill in the art would recognize, therefore, that Shakuda's doping methods are not relevant for Anayama's quantum well active layers, because in quantum well layers, the emission wavelength is determined by the discrete energy levels of the quantum wells, not by the band structure of the crystal lattice. Shakuda's doping methods would not work to effectively adjust the emission properties of Anayama's quantum wells. Instead, the emission properties of Anayama's quantum wells would have to be adjusted in a different manner (e.g., during quantum well fabrication). Accordingly, a person of skill in the art would find no reason to combine the disclosures of Shakuda and Anayama, as the Action alleges.

Second, even if, for the sake of argument only, Shakuda and Anayama were combined as the Action alleges (which Applicants do not concede), the combination still would not yield the semiconductor components covered by claims 8, 10-11, and 20. Claims 8 and 10-11 depend from independent claim 1, and as discussed above, Shakuda does not disclose an n-doped

confinement layer that "further includes the second n-dopant or an additional n-dopant" as required by claim 1. Anayama does not cure Shakuda's deficiencies with respect to claim 1, at least because Anayama does not appear to disclose a confinement layer that is doped with multiple n-dopants. Applicants have been unable to find a disclosure of such a layer in Anayama, and have not been able to find any reason in Anayama for providing such a layer. Accordingly, Applicants believe that neither Shakuda nor Anayama, taken alone or together, discloses the n-doped confinement layer required by claim 1.

Applicants further submit that Anayama fails to cure Shakuda's deficiencies regarding the at least one layer "formed of a material selected from the group consisting of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP," as required by amended claim 1. Anayama does disclose an AlGaInP cladding layer (see, e.g., layer 57 in Figure 15J of Anayama). However, as explained above, there would have been no reason to introduce such a layer into Shakuda's disclosure. Shakuda's methods are directed to doping GaN-based layers to adjust wavelength emission properties. Layers formed of materials such as AlGaInP do not require doping of the type that Shakuda contemplates and thus, there would be no reason to use such layers in Shakuda's devices – such layers would make Shakuda's doping methods moot.

In view of the foregoing, Applicants submit that independent claim 1 is patentable over both Shakuda and Anayama. Claims 8 and 10-11, by virtue of their dependence from claim 1, are also therefore patentable over claim 1 for at least the same reasons. Applicants therefore respectfully request reconsideration and withdrawal of the rejections of claims 8 and 10-11 under 35 U.S.C. § 103(a).

Similar to independent claim 1, independent claim 20 – which has been amended in this reply – covers semiconductor components that include, in part, an n-doped confinement layer that "further includes the second n-dopant or an additional n-dopant," and where "at least one layer of the layer structure is formed of a material selected from the group consisting of AlInGaP, AlGaAs, InGaAlAs, and InGaAsP." For the same reasons discussed above in connection with claim 1, Applicants submit that a person of skill in the art would have had no reason to combine the disclosures of Shakuda and Anayama as the Action purports to do.

Moreover, even if Shakuda and Anayama were combined, the result still would not yield the semiconductor components covered by claim 20, in analogy with the discussion above. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of independent claim 20 under 35 U.S.C. § 103(a).

New claim 21 has been added in this reply. Claim 21 depends from claim 20, and covers semiconductor components where "the first waveguide layer comprises a single layer that is doped with the second n-dopant and adjoins the active layer." See, for example, Figures 1 and 2 in the present application.

Claim 21 depends from claim 20, and is therefore patentable over both Shakuda and Anayama for at least the same reasons. Moreover, Applicants have been unable to find any disclosure in either Shakuda or Anayama relating to a waveguide layer that shares a common dopant with an active layer. Shakuda does not disclose waveguide layers at all – the Action admits this, and relies on Anayama to disclose waveguide layers (Action at page 4). While Anayama's waveguide layers can include a dopant (see, e.g., layer 58 in Figure 15J of Anayama), it appears that the waveguide layers that adjoins Anayama's active layer (e.g., waveguide layer 59 in Anayama's Figure 15J) are undoped. Further, as explained above, Anayama's active layer 60 is undoped, as it is formed of multilayer quantum wells. Thus, Applicants submit that claim 21 is patentable over both Shakuda and Anayama, and respectfully request allowance of claim 21.

In view of the foregoing, Applicants ask that the application be allowed.

Canceled claims, if any, have been canceled without prejudice or disclaimer. Any circumstance in which Applicants have: (a) addressed certain comments of the Examiner does not mean that Applicants concede other comments of the Examiner; (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims; or (c) amended or canceled a claim does not mean that Applicants concede any of the Examiner's positions with respect to that claim or other claims.

Fees for the Petition for Extension of Time are being paid concurrently on the Electronic Filing System (EFS) by way of Deposit Account authorization. Please apply any other charges or credits to Deposit Account 06-1050, referencing Attorney Docket No. 12406-0141US1.

Respectfully submitted,

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